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# Teaching Business Process Modelling: Experiences and Recommendations

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Abstract:

A curriculum for a university-level course called Business Process Modeling is presented in order to provide guidance for the increasing number of institutions who are currently developing such contents. The course caters to undergraduate and post graduate students. Its content is drawn from recent research, industry practice, and established teaching material, and teaches ways of specifying business processes for the analysis and design of process-aware information systems. The teaching approach is a blend of lectures and classroom exercises with innovative case studies, as well as reviews of research material. Students are asked to conceptualize, analyze, and articulate real life process scenarios. Tutorials and cheat sheets assist with the learning experience. Course evaluations from 40 students suggest the adequacy of the teaching approach. Specifically, evaluations show a high degree of satisfaction with course relevance, content presentation, and teaching approach.

**Keywords:** process-aware Information Systems, process modeling, education, teaching case

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## I. INTRODUCTION

Business Process Management (BPM) has risen in attractiveness for organizations as a holistic management practice dedicated to enabling and sustaining corporate success. The organization-wide implementation of BPM, however, is a challenging task and demands high levels of capabilities and skills from those in charge of the organizational transformation programs. Not surprisingly, building business process capability has been listed as the number one priority for chief information executives for the fifth straight year [Gartner Group 2009].

The current job market has responded to this increased awareness. When searching for "Business Process Management" on job advertisement Web pages such as HotJobs or Monster.com, queries return tens of thousands of job openings that require a substantial degree of business process expertise. Yet, many individuals currently being hired for entry level positions of business, systems, or process analysts have an educational background inadequately suited to such job requirements. Moreover, those already filling such positions, or more advanced ones, often have only enough experience to qualify them. Both the corporate and academic world has started to recognize that this level of education will not be sufficient in the future. As a consequence, a high number of universities are currently investing in the design of a process-related curriculum as part of business and IT/Information Systems programs.

The purpose of this paper is to provide recommendations for educational programs that seek to integrate building of business process capabilities into their curriculum, appropriate for the entry level positions typical of business, systems, or process analysts and which provide support for later career advancement. More specifically, this paper discusses a syllabus pertaining to the essential skill of process modelling (also called process description, depiction, mapping, design, or specification), i.e., the capabilities required to identify and document organizational business processes so as to lay the groundwork for process analysis, performance measurement, improvement, or redesign [Recker et al. 2009]. This skill set is instrumental to BPM project success. Process discovery and documentation consumes more than one third of the overall project time [Indulska et al. 2006]. Also, process modelling is a skill set required by advanced IS and IT professionals. In fact, process modelling has been named the number one skill demanded by IT graduates [http://www.networkworld.com/news/2009/040609-10-tech-skills.html].

Consequently, education providers need to integrate into their curricula a course that teaches the fundamental knowledge and skills of process specification. Yet, many stories indicate a lack of appropriate education offerings in this space [Bandara et al. 2007a; zur Muehlen 2008]. This paper describes the implementation and conduct of an appropriate course syllabus under the name of " Business Process Modelling."

This course accomplishes several educational goals. First, students learn to conceptualise and inter relate relevant areas of interest from the real world complexities of an organisation. This includes core modelling capabilities such as abstraction, generalisation, and complexity management in complex systems. Second, they learn the essential techniques and methods associated with business process specification. Third, students are exposed to the core concepts underlying process oriented organizational and information systems design. Fourth, students improve their soft skills in relation to identifying and critically assessing relevant research, and managing team work, time, and projects. Last, students learn how process modelling work is practiced as a profession and what factors matter with regards to successful and sustainable process modelling initiatives.

The paper unfolds in the following way. The next section reviews previous work related to teaching of process-related capabilities. The third section describes the course syllabus, teaching approach and content. The fourth section analyses student feedback. The fifth section recapitulates observations, lessons learned, and recommendations, and the sixth section concludes this paper.

## II. RELATED WORK

Work related to our area can broadly be differentiated in two streams, i.e., a technical and a pedagogical stream. The former relates to the body of knowledge on teaching business process management and process specification while the latter relates to the mode of conduct, i.e., relevant teaching styles.

The value and importance of process modelling has been recognized for typical business process management and information technology projects [e.g., Curtis et al. 1992; Kueng and Kawalek 1997; Larsen and Myers 1997; Okonski

and Parker 2003], as well as for more recent, advanced trends such as analysis and design of process-oriented software systems [Dumas et al. 2005], service oriented architectures [vom Brocke 2007], or Web services [Ouyang et al. 2008]. With the value of process modelling being largely undisputed [Indulska et al. 2009a], still, there is a noted lack of educational offerings on business process management or modelling to meet this demand. Past BPM success studies have directly stated the importance of appropriately skilled personnel and BPM education for successful proliferation [Kettinger et al. 1997; Larsen and Myers 1997; Grover et al. 1998; Murphy and Staples 1998]. However, lack of appropriate BPM education is still a topic that is raised as a perennial issue. Bandara et al. [2007a], for instance, quote a BPM expert stating:

> *If you take an MBA in a school in the US, you don't hear 'process'. I mean it's not being taught at Harvard, it's not being taught at Stanford. They have marketing and they have finance, etc. If they hear about process at all, it's operations under manufacturing somewhere…There is a brand new area that I believe…the university ought to jump into…, teach it, and research it.*

Similarly, our own experiences in working with companies suggests that more and more organisations are seeking to adopt a business process management approach but lack the internal competencies required to undertake this successfully. A recent Delphi study [Indulska et al. 2009b] confirmed this view. In fact, this study showed that the provision of training – or the lack thereof – is a key issue in process modelling, as noted by practitioners now and in the future.

Some examples of teaching material, however, exist. Stewart and Rosemann [2001a], for instance, describe the use of process modelling as a teaching case integrated in an ERP-oriented curriculum. More recently, Bandara et al. [2007b] developed a structured approach for determining appropriate BPM educational content material to meet the demands of current and future IS professionals. And indeed, the course described in this paper has been developed using the experiences and approach described in Bandara et al. [2007b].

Regarding research on educational teaching modes, the course described in this paper makes use of a range of teaching styles advocated in earlier work. Most notably, the course integrates the use of teaching cases similar to those reported in Stewart and Rosemann [2001b]. These cases are based on real life process scenarios and allow the students to familiarize and engage with factual process problems similar to those they would expect in corporate reality. The teaching case approach enables the instructor and the audience to focus on "real" issues faced by real organizational situations, and encourages the students to develop multiple perspectives and analytical, evaluative, and problem solving skills [Felton Jr. 1979]. Such skills have been identified as key capabilities of IS graduates, specifically in the Australian context [Edwards 2000].

Also, as part of one of the assignments in the course, poster design was employed as a teaching approach. Poster design originates from the architecture discipline, but has recently emerged as a stimulating educational approach to teaching design in engineering [Dym et al. 2005] or information systems [Nickerson 2006]. This approach is suggested as a way of integrating learning and preparing students for the corporate environments, and the design problems within, they will face after graduation.

## III. SETUP, STRUCTURE, AND CONDUCT OF COURSE

### Audience

This course is being taught as a mandated course within the dedicated Masters of Business Process Management offered at Queensland University of Technology. It also being offered as an elective in both under and post graduate curricula for Corporate Systems Management and Information Technology at Queensland University of Technology. The course is held regularly in the first semester of each academic year, and attracts about 150 students overall in both the under and post graduate version. Many students are full time working professionals and part time students. In general, these students work as business, system, or process analysts in either consulting companies or the corporate business or information technology departments of large corporations. Because of the location of the campus in downtown Brisbane, state capital of Queensland, a large percentage of domestic students tend to be employed either by state government agencies or the financial industry. In addition, more than half of the students come from other countries, and bring forth different education backgrounds.

This heterogeneity of student backgrounds leads to a high variety within the audience and presents challenges for the course designer and the instructor. On one hand, the course content needs to consider the view of computer scientists who tend to have a focus on the technical aspects of process design (e.g., process-related software requirements, software customization). On the other hand, many students have a background in business and information systems, and are more interested in the managerial issues related to the process-centred design of organisations.

## Content, Chronology, and Delivery

Process modelling is an emergent area in which a number of significant advancements have recently. For instance, the literature reports on new methods [e.g., van der Aalst and ter Hofstede 2005; OMG 2009], new application areas [e.g., Andrews et al. 2003; Sierhuis et al. 2003], and new approaches for process modelling [e.g., Balabko et al. 2005; Vom Brocke et al. 2010]. Similarly, research has established knowledge about the competencies required for the actual act of modelling, including developing domain understanding [e.g., Burton-Jones and Meso 2008], appreciating mapping requirements [e.g., Frederiks and van der Weide 2006], and understanding process-related concepts [e.g., Recker and Dreiling 2007].

In selecting appropriate content for the course, it is important to consider two main, inter related pillars of process modelling knowledge [Recker 2006; Rosemann 2006a], both of which need to be considered in a comprehensive curriculum. First, an appropriation of the methodological knowledge of process modelling, incorporating relevant process-related concepts such as choreography [zur Muehlen *et al.*, 2005] or orchestration [Si *et al.*, 2005], relevant application areas of process modelling such as systems configuration [Dreiling *et al.*, 2008], Web 2.0 technology [McKinsey 2007], or organizational redesign [Danesh and Kock 2005], and addressing relevant managerial aspects of governing process modelling projects such as release and variant management [Hallerbach *et al.*, 2007], standardization [Davenport 2005], and conventions [Rosemann 2003]. Second, an appropriation of the technical knowledge of process modelling, advancing the expertise of students in the actual modelling of processes, which requires both knowledge of state of the art modelling grammars such as EPCs [Scheer 2000], BPMN [OMG 2009], or Petri nets [Peterson 1977], and usage experience with market leading process tools, most notably ARIS [Scheer 2000] and YAWL [van der Aalst and ter Hofstede 2005]. The concept map of Figure 1 provides a visual layout of the two major foci of the course syllabus, i.e., the teaching of process specification skills, relevant methods and tools, and relevant aspects pertaining to the management and governance of process specification projects.

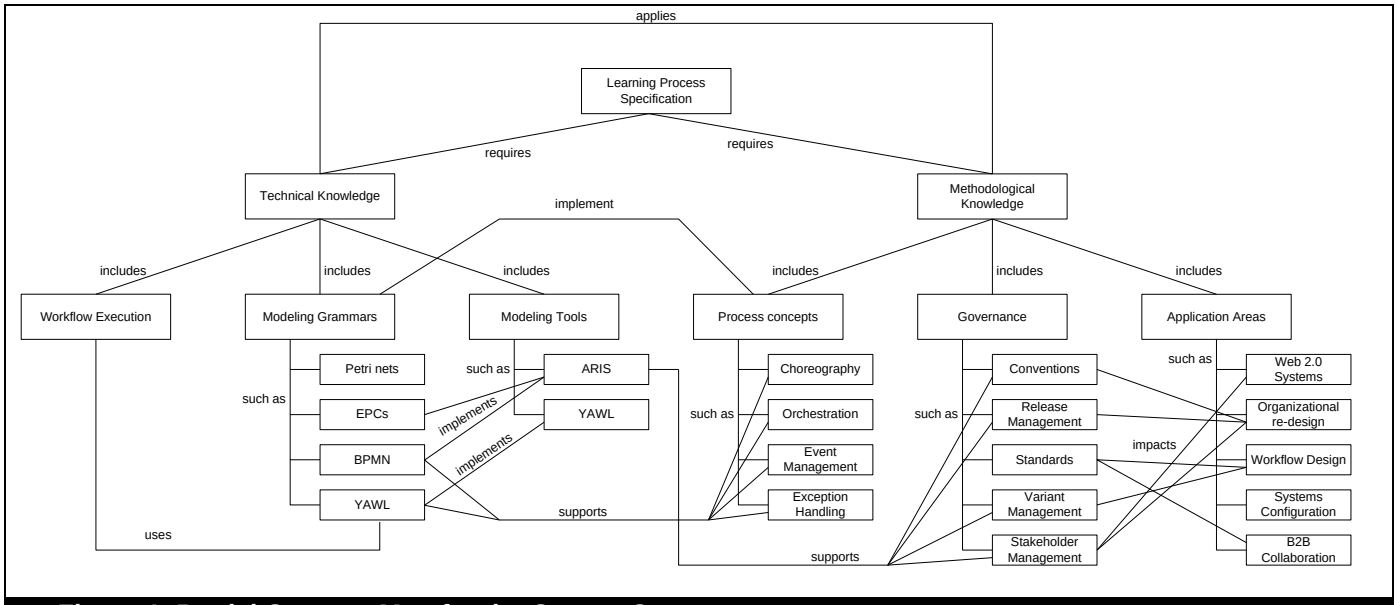


**Figure 1. Partial Concept Map for the Course Content.**

The sequence of lectures, practical labs and assignments is shown in Table 1. Overall, there are 13 lectures in this course, delivered over 13 weeks. Seven different topic areas are covered over these 13 weeks, as shown in Table 1, from "Organization of the Course" to "The Future of Process Modelling."

The first lecture introduces the students to the syllabus, related resources and assessments, and provides an introduction to basic modelling principles (such as abstraction, generalisation, association, and reduction) and to process modelling as a topic discipline (lecture topics 1 and 2 in Table 1). The second lecture, in week two, presents the general area of conceptual modelling before focusing on the area of process modelling with an introduction of the most essential notions, such as method, tool, grammar, notation, governance, purpose, and stakeholders (lecture topics 2 and 3). The lectures in weeks three to six introduce and compare in depth, three prominent process modelling grammars, i.e., Petri nets [Peterson 1977], Event-driven Process Chains [Scheer 2000], and, most notably, the Business Process Modelling Notation [OMG 2009], which is the current industry standard for process specification and enjoys significant momentum in academia and industry [Recker 2010]. These weeks cover lecture topic 3. The course is intermitted by an interlude on process architecture design most recently conducted by Paul Harmon [Harmon 2007] in week five, before moving on to lecture topic 4, "Process Model Governance," covering

process modelling governance mechanisms, conventions, variant, and release management. This content is covered in two lectures during weeks seven and eight. The lectures in weeks nine and ten discuss state of the art process modelling and management tool suites (lecture topic 5 in Table 1), such as ARIS [Scheer 2000]. The two lectures in weeks 11 and 12 discuss process specification for workflow execution (lecture topic 6, "From Process Modelling to Process Execution"). The discussion is largely based on the academic standard YAWL [van der Aalst and ter Hofstede 2005]. The last lecture in week 13 concludes the course with a recap of the contents and a discussion of recent research trends in process specification (lecture topic 7), such as process modelling for risk and compliance management [Sadiq et al. 2007] or context-aware process modelling [Rosemann et al. 2008].

**Table 1. Course Syllabus**

| Lecture No | Lecture Topic | Practical Lab Topic | Assessment Tasks |
|---|---|---|---|
| 1 | 1 Organisation of the Course<br>2 Introduction | N/A | |
| 2 | 2 Introduction (ctd)<br>3 Business Process Modelling Grammars | Modelling | |
| 3 | 3 Business Process Modelling Grammars (ctd) | Petri Nets | Assignment 1: Introduction / Topic Selection |
| 4 | 3 Business Process Modelling Grammars (ctd) | EPCs | Assignment 1: Scenario Analysis |
| 5 | *Interlude*: Process Architectures | BPMN | Assignment 1: Scenario Specification |
| 6 | 3 Business Process Modelling Grammars (ctd) | BPMN | Assignment 1: Work Evaluation / Critical Reflection |
| 7 | 4 Process Model Governance | EPCs/BPMN | Assignment 1: Submission |
| 8 | 4 Process Model Governance (ctd) | Conventions | Assignment 2: Introduction / Topic Selection |
| 9 | 5 Business Process Modelling Tools | Variant and Release Management | Assignment 1: Literature Review |
| 10 | 5 Business Process Modelling Tools (ctd) | Tool Functionality I | Assignment 2: Analysis |
| 11 | 6 From Process Modelling to Process Execution | Tool Functionality II | Assignment 2: Work Evaluation / Critical Reflection |
| 12 | 6 From Process Modelling to Process Execution (ctd) | Process Execution with YAWL | Assignment 2: Submission |
| 13 | 7 The Future of Process Modelling | Exam: Q&A | |

The delivery of content is divided in three segments, i.e., formal lectures (two hours), practical workshops (one hour), and reflective and formative assessments in the form of weekly quizzes and two assignments. The lectures introduced the content as discussed above and also each include a 15 minute open discussion of lessons learned.

The lecture-accompanying practical workshops are used to apply the theoretical and methodological concepts learned in the lectures to actual process modelling scenarios and cases, thereby reinforcing acquired theoretical knowledge through practical application. The workshops are held weekly in computer labs equipped with relevant process modelling and management tools, including modelling tools such as Microsoft Visio, process management suites (ARIS), and process simulation and execution environments (YAWL). In each of the workshops, students are confronted with real life process scenarios gathered from an extensive network of industry partners [http://bpm-

collaboration.com] or from domains that students have high knowledge of, such as online shopping scenarios (e.g., Amazon, eBay), Voice over IP applications, or Web 2.0 applications (e.g., Facebook). The appendix provides an example of a workshop sheet giving instructions about process modelling in the case of an eBay auction (Appendix 1), where an incomplete process model (Appendix 2) was provided that had to be analysed in terms of modelling errors and domain semantics conveyed, and then extended and completed based on the students' understanding of online auction processes. Table 1 summarizes all practical workshop sessions.

## Assignments

To reinforce and assess student learning, the course comprised two group assignments, halfway through the course and toward the end, as well as a final exam, and weekly reading quizzes.

The first assignment was to be approached by groups of four to five students, and denoted a comprehensive assessment of process modelling skills in a complex, real life scenario. Students were provided with brief descriptions of a number of process domains. They were asked to conduct research on the scenario processes, describe the processes textually in a detailed and understandable manner, and develop a sufficient number of process models describing these processes conceptually. Students were also expected to reflect on process modelling as a means for process design in BPM initiatives, and to critically evaluate the use of the process modelling methods used. Scenarios chosen for the assignment comprised of online processes pertaining to popular cross-organisational Web 2.0 applications, to which students had easy access and could be assumed to have direct experience with. This approach allowed the students to focus on their application of process modelling skills while avoiding potentially confounding problems of lacking domain knowledge. The scenarios included, for instance, the following:

- Organizing payment via PayPal
- Purchasing a used book on the Amazon Marketplace
- Purchasing an album on iTunes Shop
- Setting up an "event" on Facebook.com
- Conducting a video conference via Skype
- Bidding for a hotel room via Priceline.com

After becoming familiar with the core principles, methods, and techniques over the course of the course and through the first assignment, the second assignment focused on advanced issues in process modelling. The assignment had a strong research focus and students were confronted with emerging trends and standards as well as advanced technologies. Students were asked to choose one of the topics below, conduct literature reviews and research on the selected topic, provide a short and sharp contextualisation of the selected topic by stressing its significance and importance, define and relate the core concepts, architectures, methodologies, etc., conduct a detailed assessment of the topic, and include the main references that cover the essential contributions in the selected area. Topics included, amongst others:

- Comparison of Web-based open source modelling editors [e.g., Decker et al. 2008b]
- Context-aware process modelling [e.g., Rosemann et al. 2008]
- Ongoing standards development [e.g., OMG, 2009]
- Process modelling for workflow management [e.g., van der Aalst and ter Hofstede 2005]
- Process modelling business patterns [e.g., van der Aalst et al. 2003]
- Choreography modelling [e.g., Decker et al. 2008a]

In both assignment one and two, students were allowed, where applicable, to design a poster as part of their assignment deliverables. Posters have recently received increased attention in IS education as a teaching approach that stipulates process thinking as well as a focus on the design artefact as an outcome [Nickerson 2006]. Both aspects were deemed relevant to creating process specifications and, hence, students were given the option of submitting their process models in the form of design posters. To assist with the intricacies of process modelling, students were also provided with cheat sheets. These cheat sheets summarized the most important syntax and semantical rules of process modelling, and described the most typical modelling problems and corresponding workarounds (e.g., http://www.itposter.net/itPosters/bpmn/bpmn.htm). The availability of cheat sheets assisted students in overcoming grammatical problems with the use of process modelling methods, and instead allowed them to focus on the modelling case at hand. More recently, online tutorials (e.g., http://www.bpmn-community.org/) and exercises (e.g., http://www.futstrat.com/books/downloads/Exercises_and_Answers.pdf) have become available that could also be used to assist students in their process modelling. Alternatively, many tool vendors (e.g., itp-commerce, Intalio) provide online learning platforms, tutorials or comprehensive examples that could assist students in acquiring modelling, and modelling tool, knowledge.

**Table 2. List of Required Readings per Week**

| Week | Lecture Topic | Required Reading | Recommended Readings |
|---|---|---|---|
| 1 | 1 Organisation of the course<br>2 Introduction | N/A | [Davies *et al.*, 2006] |
| 2 | 2 Introduction (ctd)<br>3 Business Process Modelling Grammars | Bandara, W., G. G. Gable, and M. Rosemann (2005) "Factors and Measures of Business Process Modelling: Model Building Through a Multiple Case Study," *European Journal of Information Systems* 14, pp. 347-360. | [Frederiks and van der Weide 2006] |
| 3 | 3 Business Process Modelling Grammars (ctd) | Mendling, J., H. M. V. Verbeek, B. F. van Dongen, W. M. P. van der Aalst, and G. Neumann(2008) "Detection and Prediction of Errors in EPCs of the SAP Reference Model," *Data & Knowledge Engineering* 64, pp. 312-329. | N/A |
| 4 | 3 Business Process Modelling Grammars (ctd) | Recker, J., M. Indulska, M. Rosemann, and P. Green (2008) "An Exploratory Study of Process Modeling Practice with BPMN," BPMcenter.org, *BPM Center Report* . | [White 2006] |
| 5 | *Interlude*: Process Architectures | Harmon, P. (2009) "The Scope and Evolution of Business Process Management," chapter of the *International Handbook on Business Process Management* Springer, to appear 2009. | N/A |
| 6 | 3 Business Process Modelling Grammars (ctd) | zur Muehlen, M. and J. Recker (2008) "How Much Language is Enough? Theoretical and Practical Use of the Business Process Modeling Notation*," Advanced Information Systems Engineering - CAiSE 2008* M. Léonard and Z. Bellahsène, Eds. Montpellier, France: Springer, pp. 465-479. | [Recker 2008; zur Muehlen and Ho 2008; OMG 2009] |
| 7 | 4 Process Model Governance | Raduescu, C., H. M. Tan, M. Jayaganesh, W. Bandara, M. zur Muehlen, and S. Lippe (2006) "A Framework of Issues in Large Process Modeling Projects," 14th European Conference on Information Systems, Goeteborg, Sweden, 2006, pp. 1594-1605. | |
| 8 | 4 Process Model Governance (ctd) | Rosemann, M., and W. M. P. van der Aalst (2007) "A Configurable Reference Modelling Language," *Information Systems* 32, pp. 1-23. | [Rosemann 2006a; 2006b] |
| 9 | 5 Business Process Modelling Tools | Ami, T., and R. Sommer (2007) "Comparison and Evaluation of Business Process Modelling and Management Tools," *International Journal of Services and Standards* 3, pp. 249-261. | [Denrell 2005; Jansen-Vullers *et al.*, 2006] |
| 10 | 5 Business Process Modelling Tools (ctd) | Hallerbach, A., T. Bauer, and M. Reichert (2007) "Issues in Modeling Process Variants with Provop," 4th International Workshop on Business Process Design, Milan, Italy, 2007. | [Gottschalk *et al.*, 2005; la Rosa *et al.*, 2007] |
| 11 | 6 From Process Modelling to Process Execution | Dumas, M., W. M. P. van der Aalst, and A. H. M. ter Hofstede (2005) "Introduction," *Process Aware Information Systems: Bridging People and Software Through Process Technology*, M. Dumas, W. M. P. van der Aalst, and A. H. M. ter Hofstede, Eds. Hoboken, New Jersey: John Wiley & Sons, pp. 3-20. | [Blechar 2007; Jamie 2008; la Rosa and Dumas 2008] |
| 12 | 6 From Process Modelling to Process Execution (ctd) | van der Aalst, W. M. P, and A. H. M. ter Hofstede, "YAWL: Yet Another Workflow Language," *Information Systems*.30, pp. 245-275. | N/A |
| 13 | 7 The Future of Process Modelling | N/A –<br>Process modelling capability experiment | [Rosemann and zur Muehlen 2005; Neiger *et al.*, 2006; Rosemann *et al.*, 2008] |

In addition to the two formative and reflective assessments, the course featured a formal individual exam recapitulating main concepts discussed in lecture and workshops.

To encourage ongoing and continuous learning and engagement with relevant literature, the course also embodied an optional assessment instrument in the form of weekly reading quizzes. The objective of the reading quizzes was to encourage engagement in relevant literature, and to provide opportunities for extra marks. Each quiz consisted of a mandatory reading and a set of four multiple choice questions. Upon successful completion, students were in a position to collect additional extra marks for the course. Table 2 gives an overview of the reading papers assigned in the quiz to each lecture.

## IV. COURSE FEEDBACK

Students are asked for anonymous feedback at the end of every semester through a standardized online feedback form. This form asks the students to assess relevance, difficulty, workload, assessment and relevance of the content as well as the delivery of the teaching through the instructors. Figure 2 gives a histogram of student evaluations for the conduct of the course in 2007 and 2008.

Overall, student evaluations reported an average course score of 4.07 (standard deviation 0.94). Specifically, students perceived the course as highly relevant (mean score 3.95, standard deviation 1.06) and as providing excellent skills and knowledge (mean score 4.15, standard deviation 0.95). Organization and structure of the course was attributed with a mean score of 3.7 (standard deviation 1.24).

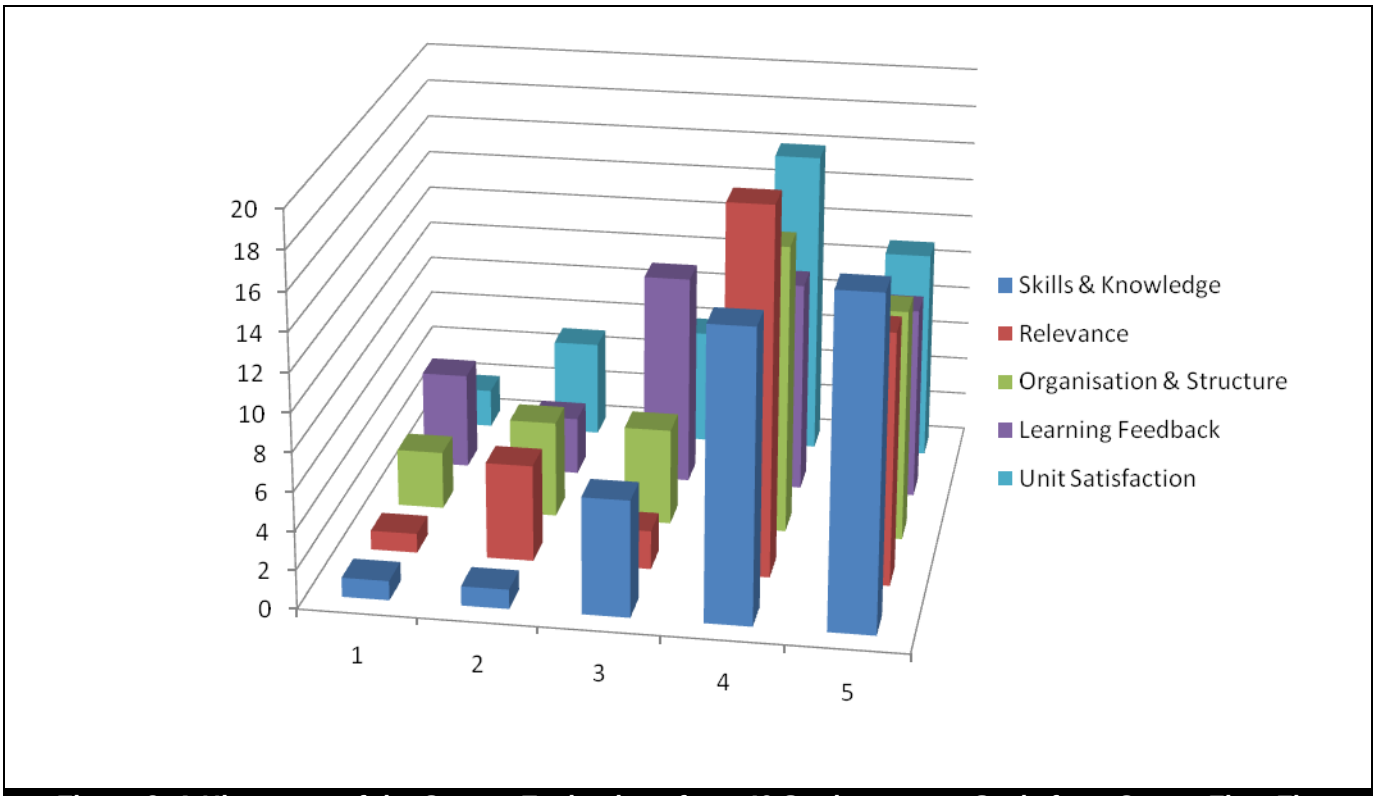


**Figure 2. A Histogram of the Course Evaluations from 40 Students, on a Scale from One to Five, Five Being the Highest Score.**

In addition to quantitative evaluations, qualitative feedback was sought from each student, by providing informal comment boxes to leave feedback.

Student comments received mostly provided positive feedback to course contents and learning approach. Specifically, the relevance of the course to current market needs ("very relevant to my work and current industry direction") and the incorporation of latest advances in research and practice ("the notable way the course is up to date with current trends makes the course interesting and relevant") were highly commended. In the words of one student:

> *This was an exciting unit to participate in, while there was a large amount of material it all added to the overall understanding of the subject. While there is a large gap between what was learnt and the reality of*

*my current employment; the skills that I have leant are being applied to narrow the gap, in ways that I never thought possible before I did this course.*

Regarding disadvantages of the course, some of the feedback received pointed to the large amount and complexity of the content covered, which was challenging to some students, especially on the undergraduate level ("the unit moved very quickly and it felt like it was taught more towards post graduate students and was more difficult for undergraduate students with no experience"). Other comments addressed the nature of the assignment tasks. While in general students appreciated the currency and relevant focus of the process modelling scenarios in assignment one and the focus on latest advances in assignment two, the nature of the assignments was geared toward a research view, which was challenging to some students:

*The assessment felt at times like it was geared towards a research group instead of an undergraduate course. […] While the research and discovery aspects of the subject are very interesting, trying to assess very recently learnt content adds to my stress as a student.*

These comments realize the challenging nature of the course and its content. And indeed, process modelling is widely known as a challenging task and building process modelling expertise is still a comprehensive task for organizations engaging in process projects [Bandara et al. 2005; Rosemann 2006a]. Nevertheless, the overall feedback received indicates that the approach taken somewhat mitigates the challenges of the content, and overall resulted in an enjoyable and well received course:

*I liked the high quality of the theoretical content of the lectures with the tutorial exercises / assignments / and real life examples. Very practical and relevant to current industry practices.*

## V. EXPERIENCES, LESSONS LEARNED, AND RECOMMENDATIONS

From the design and conduct of this course we draw a number of lessons learned. First and foremost, we recognize a need to complement the technical skills usually taught in modelling or specification courses – such as those provided in UML courses [e.g., Siau and Loo 2006], or previous process modelling course syllabi [e.g., Stewart and Rosemann 2001a; Bandara et al. 2007b] – with methodological knowledge pertaining to the establishment of process capabilities, i.e., the ability to identify, and critically reflect upon, relevant 'process' concepts such as event management, exception handling, and choreography and orchestration of inter-related business activities. Indeed, a recent experimental study [Recker and Dreiling 2007] suggested that it is often not the choice of method or technique that matters to developing process understanding, but the existence of process-oriented thinking. Also, in response to the recent published study of the characteristics of successful process modelling projects *[Bandara et al.* 2005], it must be recognized that there is more to process modelling skills than the sheer mastery of process modelling methods and tools. Notwithstanding the relevance of such technical knowledge, methodological knowledge pertaining to conduct, management, and governance of process modelling are also of high relevance to process modelling in contemporary business organizations. The course syllabus presented incorporates these aspects, and our experiences in delivering this course confirm that these topics are well sought after by students. A recent Delphi study of issues and challenges in process modelling [Indulska et al. 2009b] further confirms the relevance of these course aspects to current and future business needs.

Second, in regard to assessment approaches used, the use of familiar case domains popular among students [e.g., Facebook, Amazon) allowed us to focus within the assignments on the knowledge transfer of process modelling methods and methodologies, rather than domain information. Educational literature suggests that students will not transfer knowledge across domains unless they master the problem-solving methods and techniques they are seeking to apply [Salomon and Perkins 1989; Detterman and Sternberg 1993]. In the context of process modelling, this suggests that students should be presented with a learning environment in which they can strengthen and deepen their methodological and technical knowledge so that they can apply this knowledge across the domains they will be confronted with in business practice. Hence, the approach used in this course eliminated confounding learning problems potentially stemming from a lack of background knowledge in a business case, and allowed the students to concentrate their learning and design efforts on the mastery and application of process modelling. The current and relevant Web 2.0 scenarios in assignment one, for instance, were further well received by the students and gave both the course and the assignment tasks a "modern" touch.

Third, we found the weekly reading quizzes to be a fruitful approach to stimulate student engagement in literature and research. The quizzes met the objective of instilling knowledge of relevant literature in the students. However, it should be noted that student feedback on this assessment instrument was mixed. Some students noted the difficulty of the quizzes, yet conceded the benefits of the approach to stimulate ongoing learning ("they were a great idea to encourage reading every week"). In hindsight, the optional aspect of this assessment task also allowed students that

were uncomfortable with this approach to avoid such assessment without losing marks, and allowed eager students to benefit from their additional effort. To complement, or even substitute, the weekly paper readings, the use of a standard textbook may also be considered. A number of texts are available on the topic of process modelling, spanning topics such as the use of process modelling in business process improvement projects [Becker et al. 2003], process modelling for the design of process-aware information systems [Weske 2007], and the use of BPMN specifically [White and Miers 2008].

## VI. CONCLUSIONS

Current economic pressures toward increasing operational efficiency have increased the need for business analysts to be equipped with skills pertinent to the management and improvement and business processes. At the forefront of such activities lies the ability to identify, describe, and articulate business processes in the form of graphical process specifications so that the organizational processes can be documented, analysed, improved, and managed.

In an attempt to respond to the current and future market needs of IT and IS graduates equipped with process capabilities, this report described a course curriculum that, through a series of lectures, practical workshops and innovative formative assignments, teaches students the methodological and technical knowledge required to operate process projects. The content of the course closely relates to industry practice and embeds latest advancements in related process modelling research. Innovative assessment tasks help students reinforcing and applying lessons learnt. Students rate the course highly in terms of relevance and skills transfer and find the overall course valuable.

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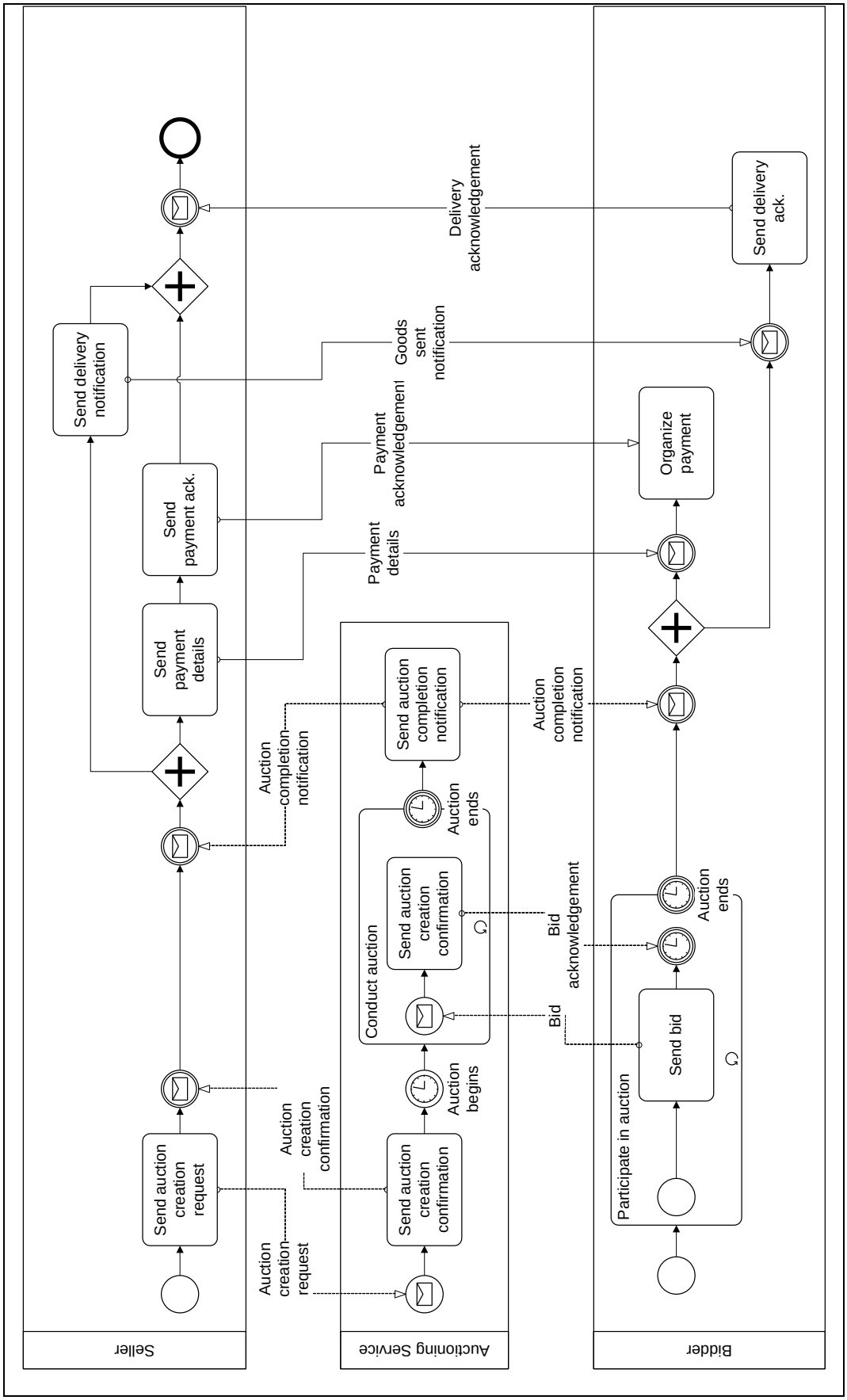
## APPENDIX 1: AN EXAMPLE FOR PRACTICAL WORKSHOP SESSIONS – THE EBAY CASE

| Appendix 1. Workshop Task Sheet | |
|---|---|
| **OBJECTIVES:** | • Develop Expertise in BPMN Modelling<br>• Develop an understanding of Assignment 1 requirements |
| **ASSUMPTIONS:** | That you are familiar with the basic and advanced BPMN set. |
| **TO BRING:** | • Tutorial work sheet<br>• Your solution for the last tutorial |
| **TASKS** | |
| **Activity One:**<br>**(10 mins)** | **Homework Discussion**<br>Please bring your solution to the goods receipt case and the related homework. Your tutor will discuss the EPC models for this case with you. |
| **Activity Two**<br>**(45 mins)** | **The eBay Case**<br>In preparation for assignment one, please carefully study and solve the eBay case as an example. Complete the following tasks:<br>• Study how an eBay auction works. Where does the lifecycle of an auction start and where does it end? Who is involved? Develop a textual description of the overall 'eBay auction process' that describes the process in sufficient detail.<br>• Develop a high-level BPMN process model for the eBay auction process that shows the general steps involved in this process.<br>• Study the detailed low-level BPMN process model for the eBay auction process that is provided below. Is it complete? Does it address the full auction lifecycle? What are exceptions that could occur in this process and which of these exceptions are covered/handled by eBay? Does the BPMN cover all these exceptions? Reproduce the BPMN process model in ARIS and make extensions and/or revisions where required to address the above.<br>• Homework for post graduate students: Remodel the eBay process using the EPC technique! Compare and discuss strengths and weaknesses of both techniques used. |
| **Questions & Close (5 mins)** | **Closure** |

## APPENDIX 2. EBAY CASE BPMN PROCESS MODEL (INCOMPLETE AND WITH ERRORS).



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